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IS 11390 (1985): Test code for hydraulic rams [FAD 17: Farm Irrigation and Drainage Systems]



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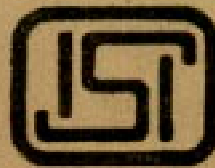
“Knowledge is such a treasure which cannot be stolen”

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Indian Standard
TEST CODE FOR HYDRAULIC RAMS

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Indian Standard

TEST CODE FOR HYDRAULIC RAMS

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Indian Standard

TEST CODE FOR HYDRAULIC RAMS

0. FOREWORD

0.1 This Indian Standard was adopted by Indian Standards Institution on 22 July 1985, after the draft finalized by the Irrigation Equipment and Systems Sectional Committee had been approved by the Agricultural and Food Products Division Council.

0.2 The hydraulic ram is an impulse pump in which the momentum produced by a flow from a low head is used to pump water to a head higher than the intake head. The hydraulic ram is being successfully used for lifting water for uplands in hills for irrigation and drinking purposes. Manufacturing of the hydraulic rams of various sizes is increasing day by day. Hence it is important that the manufacturers and users follow a uniform test procedure for evaluating the performance characteristics of hydraulic rams.

0.3 In preparation of this standard considerable assistance has been derived from G. B. Pant University of Agriculture and Technology, Pantnagar (U. P.).

0.4 In reporting the results of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS : 2-1960*.

1. SCOPE

1.1 This standard prescribes the test procedures for evaluating the performance characteristics, namely the discharge and efficiency at different magnification factors of a hydraulic ram.

2. TERMINOLOGY

2.0 For the purpose of this standard the following definitions shall apply.

2.1 Hydraulic Ram — An automatic device with which the energy of a quantity of water from a low head is used to lift proportionate quantity of this water to a greater height. This works on the principle of water hammer.

*Rules for rounding off numerical values (revised).

2.2 Size — Size of the hydraulic ram shall be expressed in terms of nominal size of intake pipe and delivery pipe expressed in mm, such as 50 × 25 mm, 100 × 50 mm, etc.

2.3 Magnification Factor — The ratio of the delivery head (h) to the intake head (H). It is also known as lift magnification (see Fig. 1).

2.4 Efficiency — The efficiency of a hydraulic ram is given by the following expression, in conjunction with Fig. 1:

$$\eta = \frac{Q \times h}{W \times H} \times 100$$

where

η = Efficiency, percent;

Q = Discharge, l/h;

h = Delivery head, m;

W = Quantity of water flowing through intake pipe l/h; and

H = Intake head, m.

3. TEST PROCEDURE

3.1 The test set up (see Fig. 1) shall have the provisions for the following:

- a) Control of intake head;
- b) Control of inflow rate;
- c) Control of delivery head;
- d) Waste water measurement;
- e) Lifted water measurement; and
- f) Provision for varying the inclination of intake pipe (optional).

3.1.1 Control of Intake Head — The intake tank may consist of a masonry or metal structure. It should have over-flow outlets at different heights above the connection of the intake pipe from the tank so as to test the device at different intake heads. The system of supply of water to the intake tank shall be recirculatory. The specifications of the intake tank shall be as agreed to between the manufacturer and the testing authority. A glass/transparent tube shall be provided to ascertain the level of water in the tank.

3.1.2 Control of Inflow Rate — To vary the inflow rate, a gate valve in the supply pipe shall be provided.

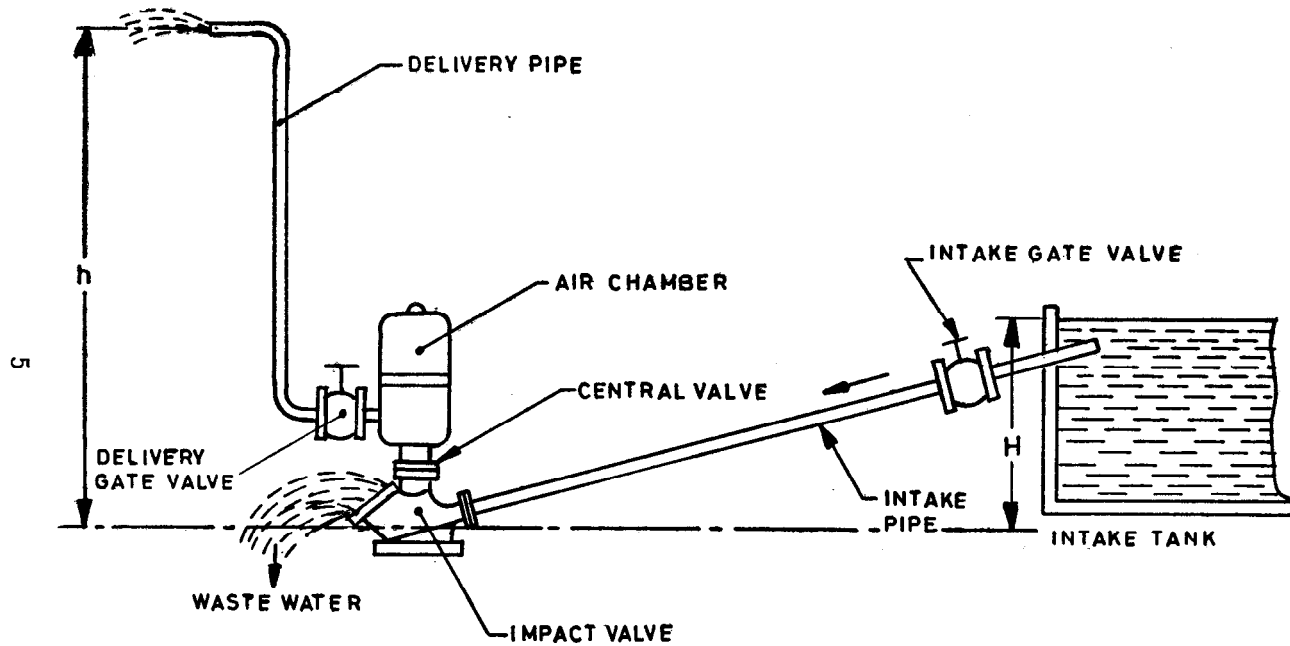


FIG. 1 TEST SET UP FOR HYDRAULIC RAMS

3.1.3 Control of Delivery Head — The hydraulic ram is used to lift water up to a magnification factor of 30. Where, it may not be practically feasible to erect delivery pipes to such a height, then a gate valve and a pressure gauge should be provided in delivery pipe to find out discharge at different pressures.

3.1.3.1 Magnification factor — shall be the ratio of delivery head (h) to the intake head (H) (see Fig. 1), where h is the distance from the centre of the waste valve to the centre of the outlet pipe and H is the distance from the centre of the waste valve to the water surface level of the source of supply.

3.1.4 Waste Water Measurement — The outflow from waste valve should be measured by an appropriate measuring device. Preferably a V-notch or volumetric method may be used.

3.1.5 Out-flow Measurement — Volumetric measurements of outflow from the delivery pipe shall be done with suitable measuring devices.

3.1.6 Inclination of Intake Pipe — The inclination of intake pipe to the hydraulic ram in general shall be 7° or the pipe length shall be 8 times of the drop. It would be desirable if the test set up has the provision for testing the performance of the hydraulic ram at various inclinations.

4. PERFORMANCE CHARACTERISTICS

4.1 The observations made during the performance evaluation test shall be recorded as given in Table 1.

TABLE 1 PERFORMANCE CHARACTERISTICS

SL No.	MAGNIFICATION FACTOR	OPTIMUM NUMBER OF BEATS/MIN	DISCHARGE, l/h	EFFICIENCY, PERCENT
(1)	(2)	(3)	(4)	(5)
	2			
	4			
	6			
	.			
	.			
	30			

NOTE — At a given magnification factor the number of beats/min may have to be adjusted to obtain the maximum efficiency.

4.2 Specification Sheet

- Size of hydraulic ram, mm \times mm;
- Intake head, m;
- Number of beats/min of waste valve;
- Angle of inclination of intake pipe; and
- Length of intake pipe, m.